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Federal Aviation Administration National Airspace System Capital Investment Plan for Fiscal Years 2004-2008

1 Introduction

The Federal Aviation Administration (FAA) Capital Investment Plan (CIP) is a 5-year financial plan that allocates funding to National Airspace System (NAS) projects based on a detailed analysis of project funding by FAA functional working groups. It is supported by the detailed technical planning in the NAS Architecture. The CIP includes estimates for the current fiscal year budget and for 4 future years' expenditures for each line item in the Facilities and Equipment budget. It provides a clear understanding of how much modernization we can do in that time. Consistent with appropriations legislation, the total funding estimates in the CIP equal the Office of Management and Budget's (OMB) future year estimates for the FAA Facilities and Equipment budget requests.

In developing the CIP, we analyzed our needs for modernization and considered how the CIP projects support the FAA strategic and performance goals. The 5-year plan gives us a long term view of NAS modernization and it helps to:

- Manage projects with a high degree of complexity successfully.
- Address capacity constraints at the largest airports and changes in user technology.
- Integrate the implementation of all the new systems to ensure financial support for interdependent systems.

2 Need for the Capital Investment Plan

2.1 NAS Modernization is a Long-Term Process

The CIP's detailed financial plan is important to ensuring that present and future resources are available to complete our capital investment projects. The CIP is a critical tool for an organization as large and complex as the FAA. The FAA does a needs-based analysis of about 190 individual capital investment projects required to sustain and improve operations. We then consolidate these capital projects into about 90 budget line items captured in the CIP. The timing of the planned project expenditures is especially important, given FAA's current philosophy of build "a little" and then test the incremental changes made before proceeding with more changes. The CIP must balance the cost of development with funds needed to implement changes in future years. It lets us integrate this complex incremental program into a multifaceted air traffic control system.

Achieving our modernization goals depends on a stable and predictable flow of funding. Since most FAA programs rely on multiyear development schedules to build and install software and hardware, fluctuations in funding have a significant effect on schedules and overall program cost. Related programs that depend on the delayed projects can also be affected adversely. Delays in implementing projects defer the benefits of modernization and impact our goals for improving the safety and efficiency of the National Airspace System.

Funding for projects in the CIP is appropriated from the Airport and Airway Trust Fund. Appropriations are authorized by the legislation that established the trust fund and identified allowable FAA trust fund expenditures. Because the authorizations for the Facilities and Equipment appropriation are expiring, the FAA must propose future authorizations. The CIP shows how we would spend future authorizations and links them to our performance goals.

The FAA developed the CIP based on a coordinated process that considers many more projects than we include in the plan. We explored alternative solutions and selected those projects that best serve to improve the NAS and have the highest return on investment. Matching future project expenditures with estimated future availability of funding is an important discipline. It results in a capital plan that reflects only those projects that have a high probability of being completed.

2.2 FAA Must Plan for the Future

Commercial air travel has more than doubled over the past 20 years and is likely to double again over the next 20 years. Because of the events of September 11, 2001, and a slowdown in the general economy, there has been a decline in the demand for air travel during late 2001 and all of 2002 from the levels of 2000. The high level of activity during 2000 often exceeded the capacity of the airport and airway system resulting in congestion and delay. Although there is a current temporary decrease in aviation growth, the FAA believes that air travel demand will resume more normal growth rates by 2005. During the late 1990s and in 2000, we were falling behind in our attempts to modernize the NAS while simultaneously providing the needed services and capabilities to the growing aviation industry. If we implement this plan and continue the capital investment it presents during the slowdown in the industry, we will be able to reach and maintain the levels needed to serve the growing aviation industry.

Several circumstances support the projections of continued growth in aviation. The general economy is expected to return to higher growth rates. The proportion of the population with sufficient time and disposable income to use air travel is increasing. The globalization of industry will continue and result in greater demand for air travel. Use of regional jets for service to smaller markets has made air travel more available and appealing for people living in those communities. The continuing success of low-cost service will also generate increased demand. By 2005 both the total number of instrument flight rule (IFR) operations at towers and the number of IFR operations handled by en route centers will regain and exceed past peaks. The FAA must make capital investments now to modernize and expand the capacity of the airway system to satisfy future demand and to avoid the congestion and delay levels experienced in the past.[1]

Many of the busiest airports are operating at or near capacity. Delay is not a linear function of aviation growth at airports operating near capacity. As the number of operations approaches and then exceeds airport capacity, delays will increase dramatically. Unless capacity is added, either by building new runways or developing more sophisticated automation systems to squeeze more landings out of existing capacity, delays will persist. The CIP must address this capacity issue to avoid increases in aviation delays.

Developing new and more sophisticated automation systems to effectively increase capacity is more challenging than developing the first generation tools to automate air traffic control. This is partly because these sophisticated automation systems often depend on information from several interrelated systems. The enhancements these tools provide depend on very precise real time information. And the benefits of these tools cannot be realized, if critical infrastructure like electrical power systems and grounding to protect against lightning strikes is not funded. Given the capacity limitations of the current NAS, spending for automation systems in future years will need to increase in order to meet travel demand.

Figure 1 depicts the complexity of the NAS, caused by the interactions among its multiple components. In addition to the fundamental air traffic functions, which require air traffic facilities to communicate with pilots and receive surveillance data from radars, operating the NAS requires several other necessary data exchanges. These include automated connections among en route centers, terminal radar control facilities (TRACONs), and the air traffic control system command center (ATCSCC), and collecting information from a variety of sources to show weather conditions and the status of navigation and landing aids. Both controllers and pilots need to know the status of over 1,000 instrument landing systems (ILS) and 1,200 navigation aids to ensure that aircraft are able to fly the routes they have requested. All of these systems must work together smoothly to provide air traffic services. This interaction among systems is shown in the NAS Architecture.

[1] Information for the two preceding paragraphs was provided by the FAA's Office of Aviation Policy and Plans.

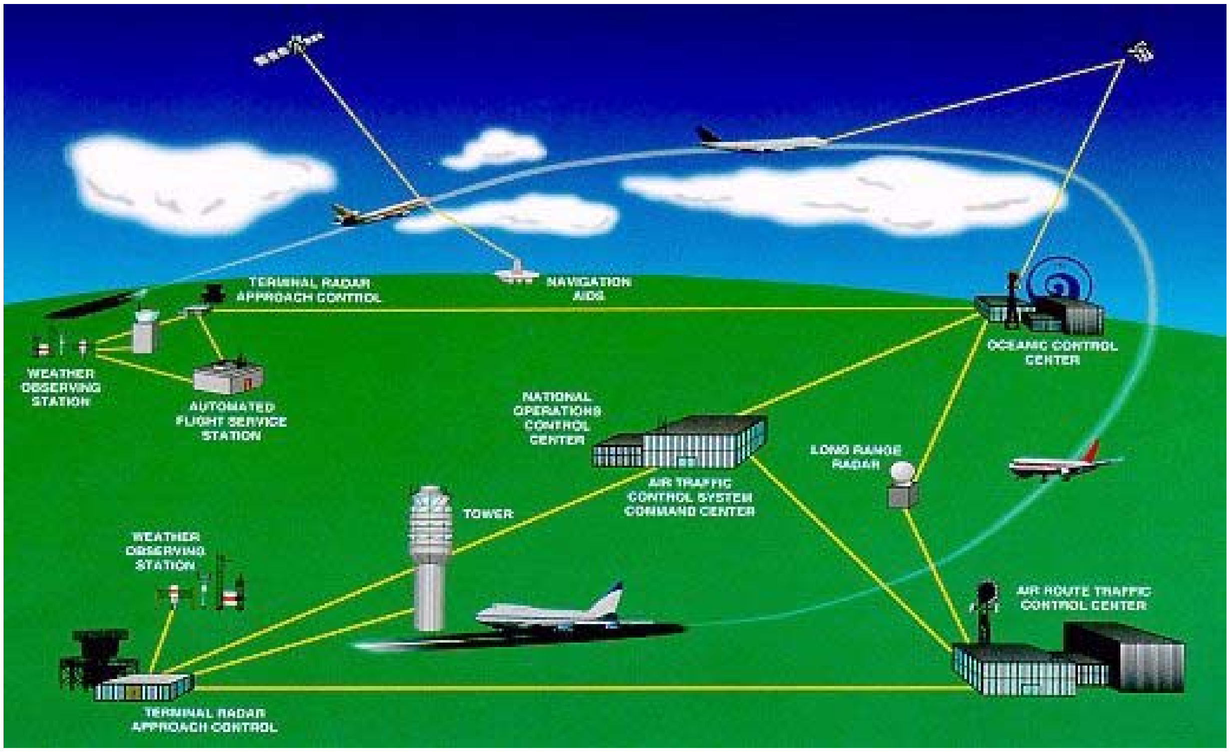

Figure 1 Components of the NAS

Another important factor in planning for future NAS expenditures is that the FAA uses commercial technology in systems that support NAS operations. Communication lines are leased from commercial providers; commercial software is integrated into the FAA systems; and the FAA normally buys commercial items like radios rather than design a unique system for FAA use. Computers, their component parts, and the peripheral equipment for larger systems, are commercial items. Some of these items have short lives on the commercial market as industrial technology can move at a very fast rate. New generations appear every 2 or 3 years. We must either keep pace with the commercial market for these items or take elaborate and expensive measures to maintain equipment that has become technologically obsolete.

In making our decisions about purchasing new equipment, we must consider the changes in technology that aviation users adopt. Avionics manufacturers are producing flight directors that can be programmed for fuel-efficient climb, descent, and en route flight profiles. Airlines are already taking advantage of data link communications with aircraft, and the FAA is planning to make more extensive use of the same technology. This requires coordinated planning with all users of the NAS. Users can realize the benefits of this new technology only if the FAA develops the equipment and procedures that support the airline investments.

2.3 The CIP Satisfies a Legislative Requirement

Beginning with the FY 2000 DOT Appropriations Act, legislation has required the FAA to submit a 5-year capital investment plan. The Act imposed a financial penalty, starting in FY 2001, if the CIP is not submitted with the President's Budget. The legislation requires that the plan estimate future spending by budget line item for all projects the FAA intends to carry out over the 5 year period.

2.4 The CIP is Based on Extensive Formal Planning

The FAA developed the CIP through a comprehensive process beginning with the most fundamental plans that define FAA's roles and the actions the FAA needs to take to accomplish them. The most basic statement of FAA's operating principles is the FAA Strategic Plan, which articulates FAA's goals for safely and efficiently serving air travel demand. The FAA Performance Plan, which is derived from the Strategic Plan, translates those fundamental goals into outcome goals that set targets for improvements in FAA performance. These targets are measurable goals for improving specific outcomes that affect the safety, reliability and financial concerns of aviation users.

To meet performance plan targets, the FAA has developed a group of closely related plans that define specific capital investments and other actions needed to improve safety and modernize the NAS. These plans include the NAS Architecture, the Aviation Capacity Enhancement Plan, the Operational Evolution Plan, and the CIP. All these plans consider the operating environment FAA expects for the future, as assessed in the FAA Aerospace Forecast (Forecast), the RTCA NAS Concept of Operations and Vision for the Future of Aviation (Concept of Operations) and the National Aviation Research Plan.

The FAA Forecast and the Concept of Operations underlie the engineering efforts that develop the NAS Architecture and set the pace of change. The Forecast estimates future air travel demand and the resulting FAA workload. The FAA uses this Forecast to gauge the size of the systems needed to accommodate future air travel demand and to ensure that the future air traffic system has the necessary capabilities. Once we forecast future demand, the Concept of Operations defines the procedures that FAA will use to handle the predicted volume of air traffic. Preparing the Concept of Operations is a critical step in deciding what equipment we need to control air traffic. The types of equipment and the configuration of this equipment are shown in the NAS Architecture.

The NAS Architecture describes the services provided in the NAS and the systems used to provide those services. The NAS Architecture contains operating diagrams for FAA systems, identifies the interactions between systems, and lays out the path to modernization. The architecture is the baseline for describing the configuration of the NAS. The FAA modifies it as needed to accommodate recommendations for improving capacity contained in the Airport Capacity Enhancement Plan (Capacity Plan) and the Operational Evolution Plan (OEP). These two plans analyze capacity issues related to present operations and recommend near-term changes that will enhance capacity and improve NAS performance. The National Aviation Research Plan, in addition to describing projects that support FAA safety and environmental goals, describes the research projects that model future NAS behavior and explores more long-term solutions to capacity problems and design of the system of the future. These plans identify which CIP projects are necessary and the appropriate implementation schedules. The FAA Office of System Architecture and Investment Analysis uses the latest version of the NAS Architecture to do the financial planning for the individual projects and estimate the annual spending levels to create the CIP. The strength of coordinating all these plans is that the systems implemented are carefully integrated into the existing NAS and deliver the planned results.

2.5 Performance Goals are Integrated with the Capital Investment Plan

Consistent with efforts across the Federal Government to tie budgeting to performance plans, the FAA must ensure that its capital projects support its performance goals. Appendix A of the CIP describes how each project supports a performance goal. Appendix B details project accomplishments for Fiscal Year 2002 and planned accomplishments for current year appropriations and projects reflected in the budget request plus 4 future years. The number of goals is limited, because the intent of performance planning is to focus attention on the most important outcomes the FAA is trying to change. The FAA has also established supplemental goals to better measure progress toward meeting the major outcome goals. The supplemental goals represent narrower strategies to support performance goals, and they are based on an analysis of those factors that are most likely to affect performance outcomes.

Performance goals also play an important role in setting priorities for capital projects. As FAA plans for future expenditures, recognizing agency performance goals allows us to give a higher priority to those projects that contribute the most toward meeting a performance goal target.

3 FAA Performance Goals

3.1 Government Performance and Results Act Requires a Performance Plan

The Government Performance and Results Act (GPRA) of 1993 established Federal Government performance planning as a three-step process. The first step is developing a strategic plan containing a set of broad strategic goals describing the agency’s mission. The second step is developing a Performance Plan, containing a limited number of outcome goals that guide decisions about resource allocation and agency management. The third step is preparing a report on the performance achieved compared to the goals established in the Performance Plan.

The FAA Strategic Plan contains the broad strategic goals that define the fundamental purposes of the agency. These goals articulate the agency’s role in improving a measurable service provided to users or the environment in which users consume the services provided by the agency. The FAA Strategic Plan is a long-term plan, updated every 3 years. FAA's strategic goals are:

- **Safety:** By 2007, reduce fatal accident rates by 80 percent from 1996 levels.

- **System efficiency:** Provide an aerospace transportation system that meets the needs of users and is efficient in the application of FAA and aerospace resources.

- **Security:** Most of FAA's security functions have been transferred to the Transportation Security Administration and this strategic goal is under review.

- **Organizational excellence:** Improve organizational excellence.

The annual Performance Plan flows from the FAA Strategic Plan. The Performance Plan translates the broad strategic goals into specific performance goals, stated in outcome terms. Outcomes are changes that improve fundamental aspects of human life, such as health, safety, and financial concerns. The Performance Plan sets specific targets for annual performance goals, so the agency's progress in meeting the goal can be measured. The annual Performance Plan contains targets for outcomes in the budget year and discusses the results of the previous year's actual performance compared to the targets set for that year.

The FAA GPRA and supplemental performance goals are:[2]

3.2 Safety

<u>GPRA Safety Goals</u>

1. By 2007, reduce the U.S. commercial aviation fatal accident rate per aircraft departure from a 1994-1996 baseline of 0.051 fatal accidents per 100,000 departures. The Fiscal Year (FY) 2004 target is 0.028 per 100,000 departures.

2. Reduce the number of general aviation fatal accidents. The FY 2004 target is no more than 349 fatal accidents.

<u>Supplemental Safety Goals</u>

- Reduce the number and rate (per 100,000 operations) of highest risk (category A & B) runway incursions. The FY 2004 target is no more than 47 category A & B runway incursions, which is a rate of .072 per 100,000 operations.

- Reduce the number of Category A & B (highest severity) operational errors. The FY 2004 target is no more than 629.

[2] All information on FAA GPRA and supplemental performance goals was provided by the FAA Office of Cost and Performance Management.

3.3 System Efficiency

GPRA System Efficiency Goal

1. Increase the percentage of aircraft arriving no later than 15 minutes after the scheduled arrival time to 79.2 percent in FY 2004 at the 32 largest hub airports.

Supplemental System Efficiency Goals

- Increase the sum of facility-set arrival rates at the 35 airports identified in the Operational Evolution Plan (OEP). The target for FY 2004 is 49,120 arrivals.

- Increase the percent of time arrival demand is satisfied at the 35 airports identified in the OEP to 95.49 percent in FY 2004.

3.4 Human and Natural Environment

GPRA Human and Natural Environment Goal

1. The number of people in the U.S. exposed to significant aircraft noise levels. The FY 2004 target is no more than 436,000 people.

Supplemental Goal

- Increase the number of people in residential communities that benefit from an airport improvement program noise compatibility project. The FY 2004 goal is 25,000 people.

3.5 Organizational Excellence

GPRA Organizational Excellence Goals

1. Achieve a green rating for the following areas in the President's Management Agenda (A green rating is based on meeting several criteria established by the Office of Management and Budget for success in the areas listed below.)

    - Strategic management of human capital
    - Competitive outsourcing
    - Improving financial performance
    - Expanded electronic government
    - Budget and performance integration

2. Improve the FAA score on the commercial pilot segment of the American customer satisfaction index (ACSI) survey. The FY 2004 performance target for the FAA score on the commercial pilot segment of the ACSI is 63.

3. Achieve 80 percent of designated acquisition milestones for critical programs and maintain program costs in 80 percent of critical programs as published in the Capital Investment Plan.

4 Performance Metrics

4.1 Performance Metrics Assist in Achieving Performance Goals

Achieving performance goals often requires a comprehensive set of actions – including policy, regulatory, organizational, operational, economic and technical activities. To track progress, we need clear measures that will evaluate the impact of individual programs. However, broad measures often capture results from several initiatives rather than the changes caused by an individual action, and it is often difficult to select a metric that discriminates the impact of a single action. Careful analysis is necessary to select metrics that gives meaningful data about outcome changes.

The Free Flight program has developed several metrics to measure the impact of improvements they have made to the air traffic control system. One of the metrics used is the change in arrival rates at a specific airport. The number of aircraft that can be accommodated at the airport is measured before new automation equipment is installed, and then the number accommodated is measured after it is installed. The FAA has found that Free Flight initiatives can increase the number of aircraft accommodated during peak hours by 3-5 percent. Metrics are a valuable tool for this program.

Performance metrics are needed to help us decide whether we are adopting the right strategies to meet performance targets or whether we need to adjust programs to address goals in other ways. In a complex environment such as the NAS, it is important to remember that initiatives are interdependent and performance metrics such as efficiency rates have multiple causes and influences.

4.2 Relationship of Performance Metrics to Performance Goals

The most useful metrics provide specific information about progress towards a performance goal. To establish a metric, the FAA analyzes the steps and most relevant factors needed to achieve the outcome stated in the goal. After identifying these key factors, FAA measures performance before the steps needed to meet the performance goal target are implemented and establishes baselines for associated metrics. As projects or procedures are implemented, FAA collects data to determine whether the project or procedure is contributing toward meeting the performance goal. Knowing the outcome of initiatives is an essential part of managing to performance goals.

In some cases, secondary metrics that do not directly measure an outcome but do measure a significant process are used to understand how we reach goals. For example, system reliability is not an explicit performance goal, but metrics can clarify the specific impact that reliability has on capacity and system efficiency. When the FAA must decide whether to upgrade existing equipment or install new capabilities, this metric can be very valuable in determining which action will have the most impact on system congestion and delay issues. These secondary metrics play an important role in helping us meet performance goal targets.

4.3 Use of Performance Metrics

Some of the most valuable metrics are location specific. For example, determining the impact of new automation tools or new procedures on the arrival capacity at a specific airport is a precise measure of those tools and procedures. We can collect data at several airports to give an overall picture of performance improvements, but the data at the level of the individual airport often gives a unique and significant view of new tools, technologies and procedures.

Performance metrics describe short-term progress toward performance goals, providing early signals on the success or failure of a specific initiative. Over time, metrics can identify long-term trends and help us understand the success or problems with strategies to achieve goals. Metrics have a role in both short-term and long-range decision making.

4.4 Examples of Performance Metrics

The FAA has adopted clear sets of performance metrics tied to agency strategic goals. Metrics are both science and art, so the FAA is continually reviewing program measures to make sure they are useful to understanding progress towards goals and are part of data-driven decision making. The metrics below are part of the OEP Metrics Plan, and can be used along with other internal metrics such as project status measured against cost and schedule baselines to improve management.

- Average minutes late per flight
- Percent of flights on time
- Ground stop minutes
- Average daily arrival capacity
- Average daily flights
- Airport Efficiency Rate
- Airport Capacity in Visual Meteorological Conditions
- Airport Departure Rate
- Airport Arrival Rate
- Airport Capacity in Instrument Meteorological Conditions
- Airport Instrument Meteorological Conditions Index

5 Capital Investment Projects Relate to Performance Goals

5.1 Safety is the Highest Priority

Aviation safety is the primary mission of the FAA, and our performance goals reflect this commitment. The aviation industry also recognizes that air transportation could not thrive without the guarantee of safe operation. Safety is the first consideration in designing new programs. FAA will not implement a project unless it maintains or improves the safety of the NAS. The FAA has several safety programs, including operational programs that focus on regulating the design and operation of aircraft and licensing the aviation personnel who operate and maintain aircraft. Safety performance goal targets are used to stimulate new initiatives to improve our already high aviation safety standards.

Achieving the results articulated in the safety goals requires targeted initiatives. To ensure that the safety programs reflect best industry practices and are embraced by aviation users, the FAA has convened groups to identify strategies and capital improvements that hold promise for improving safety. Examples are the Safer Skies initiatives and the Commercial Aviation Safety Team (CAST). The organizations that support these efforts have access to safety data and analyze proposed actions to recommend improved safety practices. This analysis, a key element of performance management, evaluates present performance to determine which programs will improve performance in specific areas with the greatest risk. In the safety area, the Safer Skies initiative identified areas of risk for commercial aviation and general aviation. Examples of commercial and general aviation risk areas are:

- Uncontained engine failures (commercial)
- Controlled flight into terrain (both commercial and general aviation)
- Approach and landing (commercial)
- Loss of control (both)
- Weather (both)
- Pilot decision making (general aviation)
- Runway incursions (both)
- Survivability (general aviation)

The CIP contains several projects addressing those risk areas that can be reduced with improved NAS technology. We plan investments for:

- Weather systems that improve weather detection and reporting for both terminal and en route flight segments. By providing more timely and accurate forecasts of adverse weather, these systems will reduce weather related accidents.
- Systems to detect potential runway incursions. Detecting potential incursions and warning pilots addresses this significant safety issue and thus helps to prevent serious runway accidents.
- Projects that improve approach and landing safety, such as augmenting the global positioning system (GPS) to allow precision landing guidance at more airports and improvements to approach lighting and visual landing aids.

The paragraphs below discuss the major projects to support improvements in safety performance goal targets.

5.1.1 Weather Risks

Weather is a primary factor in more than 35 percent of commercial aviation fatal accidents. Wind shear near an airport and turbulence caused by convective activity (mainly thunderstorms) are among the greatest risks. Wind shear is often associated with severe thunderstorms and has caused jet aircraft approaching a runway to crash. Reducing the risk of accidents caused by wind shear and other weather phenomena depends on timely and accurate warnings to pilots, allowing them to avoid this hazardous weather. The following key projects provide the information for timely and accurate warnings:

5.1.1.1 Wind Shear Alerting Systems

The FAA has installed terminal Doppler weather radars (TDWR) at 45 large airports with the most wind shear risk. The TDWR displays show areas of wind shear and gust fronts, which enable tower controllers to warn pilots of existing wind shear conditions. The existing TDWR systems have experienced maintenance problems, and we need to invest capital in a Service Life Extension Program to ensure that these vital safety systems operate reliably through the year 2020. The FAA has also installed low level wind shear alert system (LLWAS) and the weather system processor (WSP) at additional airports to provide wind shear warnings. The LLWAS uses sensors to detect differences in winds at several locations on and around the airport. The WSP modifies the airport surveillance radar, used for air traffic control, so that it can display wind shear conditions. We are developing the medium intensity airport weather system (MIAWS) as a low cost warning system for wind shear at 40 medium sized airports. The MIAWS uses the National Weather Service radars to gather information on hazardous wind conditions. We will deploy the MIAWS in 2005 and 2006. The wind shear systems, already installed, have been a major factor in reducing the risk of accidents, but they must be updated to continue providing vital safety information. The challenge to FAA is to provide protection from wind shear consequences at as many airports as possible recognizing that benefits from these systems need to exceed the estimated costs

5.1.1.2 Better Information about Weather Conditions near Airports

The Integrated Terminal Weather System gathers data from several weather sensors and displays an image of current weather for airport towers. The system also provides 10 and 20-minute projections of how weather systems will move near and over the airport. Controllers use this information to provide weather alerts to pilots concerning hazardous weather and to decide which runways to use for takeoff and landing. Tower supervisors choose the runways that have the least risk of encountering hazardous weather conditions, but they try to avoid frequent changes in runway configurations for takeoff and landing that could disrupt air traffic and can cause delays. Having a detailed picture of weather affecting the airport and the path that weather is following helps controllers make better decisions on how to configure the traffic flows into and out of the airport and to provide more precise warnings to pilots flying near the airport. The 38 systems being purchased for this project are scheduled to be installed and tested during fiscal years 2002 to 2004.

5.1.2 Monitoring Aviation Safety

In addition to the projects that upgrade air traffic control equipment to ensure safe separation of aircraft, the CIP supports many other safety programs including:

- Issuing licenses and certificates to ensure that aviation personnel meet established qualifications and that manufacturing and repair facilities conform to standards for design and modification of aircraft
- Monitoring both the companies that provide aviation services and the aviation personnel who are employed by those companies to ensure that safety is always paramount in the industry.

There are approximately 20,000 aircraft in commercial service. Over 600,000 pilots and more than 300,000 mechanics are licensed by FAA. Because of the large number of commercial operators, aviation personnel and repair facilities, the FAA needs automated tools to track their safety records and to ensure adherence to regulations and standards. We have made substantial investments in information technology systems and efforts to keep these systems up to date and expand their usefulness.

5.1.2.1 Data Support for Aviation Safety Inspectors

The Aviation Safety Analysis System supports a number of databases used in the safety program. The databases include records of licenses and certificates, violations of FAA regulations, and accident and incident data for individuals and airlines. These databases support analysis and enforcement activities of FAA safety inspectors and certification staff. Without automated support, we could not inspect or certify the large number of aviation related entities efficiently.

5.1.2.2 Enhancing Safety Oversight

Meeting our goal for reducing fatal accidents depends on preventing accidents. The CIP includes three projects to enhance oversight of the aviation industry so we can discover safety issues before accidents occur. The System Approach for Safety Oversight program will develop and implement a proactive system safety approach to help identify and ensure compliance with best safety practices, to regulate the aviation industry, and to manage safety risks to eliminate accident causal factors. The Integrated Flight Quality Assurance program is in the testing phase for collecting data from individual airlines' flight operations quality assurance programs. The raw data from the airlines is collected from airline flight data recorders. It will be analyzed to uncover any safety issues in day-to-day operations. The Aviation Safety Knowledge Management Environment System supports aircraft certification by storing information relating to the design and certification of aircraft.

5.1.3 Preventing Runway Incursions

Runway incursions create dangerous situations that can lead to serious accidents. Reducing the number of runway incursions will lessen the probability of accidents that potentially involve fatalities, injuries and significant property damage. We are increasing our focus on preventing pilots or ground equipment operators from unintentionally entering the path of an aircraft taking off or landing. The FAA Office of Runway Safety studies the causes of runway incursions and develops strategies to prevent them. To support these strategies, we have developed training programs and technologies to aid controllers, pilots, and vehicle operators in recognizing potential runway incursions. The FAA continues to research alternative technologies to prevent runway incursions.

5.1.3.1 Airport Surface Detection Equipment – Model X

To protect against runway incursions at airports that do not have an airport surface radar, the FAA is developing the airport surface detection equipment – model X (ASDE-X). This system uses advanced technology to detect aircraft and ground vehicles in the airport operating area. In addition to a radar sensor, other electronic aids are used to detect and locate aircraft and vehicles by processing position information provided by these electronic aids and then calculating the exact location of the vehicle or aircraft. We will deploy ASDE-X at 25 operational sites.

5.1.3.2 Airport Surface Detection Equipment

The FAA has installed airport surface detection system equipment - model 3 (ASDE-3) at more than 30 locations. This system provides controllers with a radar display of aircraft and vehicles in the airport operating area during low visibility conditions. The ASDE-3 is enhanced with the airport movement area safety system, which gives automated runway incursion warnings. Controllers can use these systems to alert pilots and ground vehicle operators of incursions to avert accidents. We need to invest capital to modernize these systems so that they continue to operate efficiently over the next 10 years. In addition, we are adding the technology that uses electronic aids to detect aircraft and ground vehicle location, developed in the ASDE-X program, to seven of the ASDE-3 systems.

5.1.3.3 Preventing Aviation Accidents

FAA is demonstrating several advanced technologies that contribute to flight safety. These technologies include automatic dependent surveillance, data link and global positioning system (GPS) satellite navigation. The automatic dependent surveillance-broadcast (ADS-B) technology allows aircraft to automatically broadcast their position to air traffic control facilities and other aircraft. In areas with no, or limited, radar coverage ADS-B will give controllers more precise information on aircraft position.

Data link is another important new technology. Data link will eventually allow pilots to receive cockpit displays of aviation weather conditions. It can also be used to transmit air traffic control instructions. Pilots can use the data link information to avoid weather hazards and to ensure accurate interpretation of air traffic control instructions.

3.6.3.4 Preventing Controlled Flight into Terrain

In the recent past, there have been many fatal accidents involving controlled flight into terrain due to poor situational awareness. The Safe Flight 21 program is working with the aviation community to evaluate the benefits of providing additional information to pilots through an affordable terrain database and display. Use of this database coupled with the use of GPS navigation capability and the wide area augmentation system can provide warnings about high terrain near the flight path of the aircraft. Evaluating this technology is part of the Safe Flight 21 program being conducted in Alaska and the Ohio River Valley.

5.2 Improve System Efficiency To Support Future Growth in Aviation

The FAA has carefully analyzed several key measures of NAS capacity and efficiency to select the performance goal that is most closely aligned with the system efficiency strategic goal. The measure used for the 2004 performance goal, which is to increase the percentage of on-time arrivals, addresses one of the most important considerations in improving efficiency - delays. Maintaining schedule is important to both passengers and airlines. Airline operations can be severely impacted by delays in many ways; one of which is an increased risk of exceeding gate capacity at an airport. This results in holding aircraft outside the gate area causing further delay. Delays have many causes, and two subsidiary goals further refine the measurement of actions that the FAA has taken to increase on-time arrivals.

Just as in the safety area, industry is an important partner in defining the steps needed to meet the efficiency goal. Industry groups such as RTCA and independent research groups such as the Transportation Research Board have been key players in developing initiatives that will improve use of system capacity. For example, RTCA has provided guidance for the Free Flight program and for use of satellite navigation. Broad industry cooperation has resulted in the Operational Evolution Plan (OEP), which contains several recommendations for operational changes and new technologies to reduce airport delays.

In response to suggestions from industry and research organizations, the FAA has developed several projects that promote system efficiency. These include automation systems for strategic management of the air traffic control system. The air traffic control system command center (ATCSCC) located at Herndon, Virginia tracks all air traffic in the United States and uses sophisticated software tools to predict problems or delays in the system. Using the collaborative decision-making tools, FAA can consult with commercial users, and the ATCSCC can regulate flows in the system to prevent large hub airports from being saturated with more traffic than the airport can handle. When delays are necessary, because of hazardous weather or runway closures, the delays can be taken on the ground, which is less costly. The ATCSCC also coordinates with traffic management units at the en route centers and the busiest tower/terminal radar control facilities (TRACONs). These units scan the flow of incoming traffic and recommend actions that smooth traffic flow to match it to runway capacity. Coordination with DoD and international air traffic control facilities is also necessary when military operations or international traffic are expected to influence operational flows.

The paragraphs below discuss the major projects that support system efficiency performance goals.

5.2.1 Adopt Modern Technology to Avoid Radio Congestion

As the number of aircraft using air traffic control services increases, the radio frequencies used by controllers for communication with pilots become more congested. To ensure enough capacity to handle future demand, we must upgrade the radios used by controllers. Two major projects are developing systems that make more efficient use of the radio frequencies assigned to FAA for voice communications. The next generation communication system (NEXCOM) uses digital technology and increases the number of channels per frequency to provide more capacity. The aeronautical data link program is developing a data link system so text messages can be transmitted and received from aircraft. This can provide controllers and pilots an automated communications path separate from the radio communications path that often is congested and can lead to miscommunication in busy airspace.

5.2.1.1 Radio Capacity and Capabilities

The NEXCOM uses the existing frequencies assigned to FAA, but it increases the capacity of these frequencies up to four times. Using a technology that provides four channels on one frequency, NEXCOM will increase the voice channels for communication between pilots and controllers and enable one of the new channels to support data link communications. The switch to digital technology will also provide technical advantages over the existing analog technology. We will implement NEXCOM incrementally. We will switch to digital radios over the next ten years, and add enhancements during and after the transition.

5.2.1.2 Efficiency of Radio Communication

Data link technology allows text messages and, in later phases, graphics to be transmitted from the ground to aircraft in flight. Sending messages by data link can provide controllers and pilots an automated communication path separate from the voice radio communications path. It is also more accurate because the pilot can save the message and check it as necessary. Graphics messages can include weather maps and forecasts and displays of nearby air traffic. They will help pilots make better decisions. Data link applications will start with simple standard text messages. Currently, flight plan clearances are being sent by data link at 58 airports. We will add features as we test and prove the technology. Key issues in implementing data link are to ensure that the message being transmitted is not altered or truncated in transit and that both the pilots and controllers are assured that the source of the message is legitimate.

5.2.2 Increase System Capacity

Several capital investment projects will help increase NAS capacity by allowing additional operations at busy airports. The largest 31 airports handle 69 percent of commercial passenger travel[3], and most of these airports are operating near capacity. As demand grows, they will need additional runways and more sophisticated air traffic management tools. The OEP addresses this issue and contains recommendations to maximize the capacity at airports with delay issues. Constraints on construction of new runways results in runway capacity growing more slowly than demand, and FAA must invest in systems that effectively add capacity by using the airspace more efficiently. The most significant projects that increase capacity are described below.

5.2.2.1 Instrument Landing Systems

Every year, the FAA installs several new instrument landing systems. The systems provide precision approach guidance to new and existing runways that could not otherwise be used safely when visibility is limited. They increase capacity because airports will either have low visibility capability for the first time or will have additional runways available during adverse weather conditions. Several other CIP projects are necessary to support the installation of additional instrument landing systems. The systems require one or more runway visual range sensors to report runway visibility to pilots and controllers. The systems also require approach lights for the runway to help the pilot see the runway after descending to the minimum altitude allowed. Status displays are needed in the tower to inform controllers whether the systems are operating correctly.

[3] Information provided by the FAA Office of Airport Planning and Programming.

5.2.2.2 *Free Flight Phase 1 and 2*

The Free Flight Phase 1 and 2 programs include initiatives that promote more efficient use of existing capacity. In Free Flight Phase 1, FAA installed the traffic management advisor (TMA) in seven en route centers. All seven are operational. These automation systems can increase the number of aircraft handled during peak hours at an airport by up to 3 percent, which can have a significant impact on delays. When approaching aircraft exceed the capacity of the airport, controllers must increase the length of the routes used to line up aircraft to approach runways, which decreases efficiency. The TMA software coordinates actions taken by the center and a tower so that traffic flows are organized before they enter the boundaries of terminal airspace, which results in more efficient use of runway capacity.

Free Flight Phase 2 will complete the installation of TMA and the user request evaluation tool (URET) at all 20 en route centers. URET allows an air traffic controller to project an aircraft's flight route into the future and determine whether a change in route will create conflicts with other traffic. With this information, a controller can approve direct routing as requested by pilots, which normally saves flight time and fuel. Phase 2 will also sustain and improve several other automation systems installed during phase 1. An example is the collaborative decision making we use to communicate with airline operations centers. This allows us to determine the best way to deal with potential delays due to adverse weather or other airspace congestion problems.

5.2.2.3 *Air Traffic Management*

In past years, air traffic control relied on a first-come first-served rule. By the late 1980s, it was clear that this strategy was not the best way to deal with demand. Gradually, we installed traffic management units in the centers and busiest TRACONs. Some of the methods for traffic management were fairly simple, such as alternating east and west departures and controlling the mix of takeoffs and landings to keep from flooding sections of airspace. Others were more sophisticated and dealt with obtaining real-time data on airspace restrictions and managing traffic flows into the airport. The many tools developed in the early stages of the air traffic management program, coupled with the tools deployed by the Free Flight program, reduced delays and increased our ability to accommodate arriving aircraft by 5 percent. Managing air traffic through tactical and strategic planning has been very productive. Sustaining that productivity requires the hardware that supports this automation be modernized regularly to ensure we can maintain the efficiency of the system.

5.2.2.4 *Other Capacity-Enhancing Projects*

FAA has several other initiatives that will enhance NAS capacity. Using GPS navigation augmented with the wide area augmentation system, more pilots will have the opportunity to fly direct routes using a technique called area navigation (RNAV). The advantage of RNAV is that pilots can fly direct routes between geographic points rather than having to fly between radio navigation aids, which often saves time and distance. We will commission the wide area augmentation system in December 2003.

The local area augmentation system will provide precision approach guidance to multiple runway ends. This will increase capacity of airports during low visibility conditions by allowing approaches to more runways than those equipped with an instrument landing system. The first unit will achieve initial operating capability during fiscal year 2006.

The FAA is also developing standards and procedures for reducing the separation for en route aircraft. Currently aircraft flying above 29,000 feet must have 2,000 feet of vertical airspace separation. Reducing separation to 1,000 feet makes more altitudes available for efficient flight profiles resulting in fuel savings and reduced controller workload.

Airspace redesign will also increase the number of aircraft that can be handled by allocating the airspace more efficiently in both en route and terminal operating areas.

5.2.3 Increase System Efficiency

Because of past limits of surveillance and communications technology, control of aircraft in oceanic areas has been less efficient than control of aircraft in domestic airspace. We must modernize both the control system and our procedures to accommodate the rapid growth in transoceanic travel. The FAA is buying a new automation system to automate oceanic control. Coupled with automatic dependent surveillance and satellite communications, this system will greatly improve efficiency in oceanic air traffic control. When controllers have more accurate reports on aircraft position and can communicate quickly and accurately with pilots flying over the oceans, they will be able to reduce separation below current levels. Aircraft then can fly shorter routes and at altitudes that minimize fuel consumption.

The FAA must also modernize the TRACON facilities, towers, surveillance systems and terminal automation systems to accommodate demand at airports. If demand increases in future years as expected, the FAA must use more sophisticated techniques to ensure optimal use of runway capacity. This requires additional capacity in the automation systems and new surveillance systems to provide information in a digital format. Facility upgrades are needed both to support the new capabilities and to accommodate new runways and construction at airports.

5.2.3.1 Advanced Technologies and Oceanic Procedures (ATOP)

The FAA is allocated 80 percent of the world's oceanic controlled airspace, defined as airspace beginning approximately 200 miles off shoreline and consisting of 3.3 million square miles in the Atlantic and 21.3 million square miles in the Pacific. FAA's Oakland, New York, and Anchorage air route traffic control centers manage oceanic air traffic. The new oceanic automation system sets the stage for reducing aircraft separation from 100 nautical miles to 30 nautical miles. Data indicates that for every dollar spent by the

FAA, approximately 8 to 10 dollars of benefits accrue to the airlines, to the flying public and to the FAA.

The ATOP program will obtain a single, integrated oceanic system for all three centers with common procedures, training and support. With initial operational capability, ATOP will move controllers away from manual bookkeeping with its paper strips and make use of the latest communications and surveillance technology for off-the-glass air traffic control. The new automation system is scheduled for initial operational capability at the three oceanic centers beginning with Oakland in 2003.

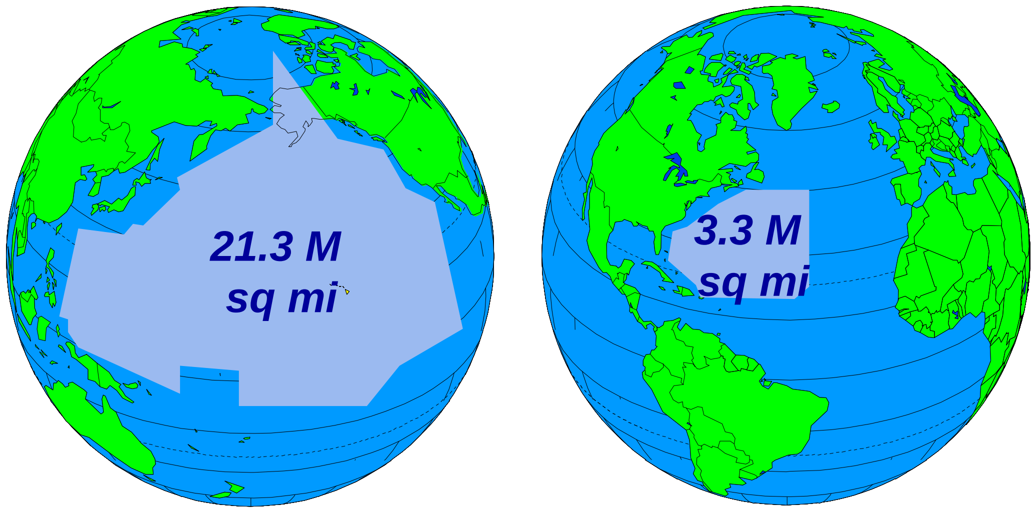

Figure 2 U.S. Oceanic Airspace

5.2.3.2 Operational and Supportability Implementation System (OASIS)

Flight service stations provide weather briefings for pilots and accept flight plans from them. OASIS is a replacement system for flight service station automation. When the flight plan indicates that the pilot will be flying in controlled airspace, the flight service station sends the appropriate flight plan information to air traffic facilities that will be controlling the aircraft's flight. The existing systems have inefficiencies that will be corrected by the replacement system.

5.2.3.3 Standard Terminal Automation Replacement System (STARS)

FAA operates three different models of automation systems for terminal area radar control (TRACON) facilities. TRACON facilities control air traffic as it approaches or departs airports. The existing automation systems were designed and installed in the 1970s and upgraded in the 1980s and 1990s. We are planning to replace terminal automation systems with STARS. After STARS is installed, the terminal facilities will be equipped with a standardized system scaled to its activity. The new system will also expand computer capacity so that new automation tools can be used to increase efficient use of airspace

The FAA initially intended to buy an existing automation system for the STARS project, but we found that we had to modify the commercial systems to meet our needs. In order to address controller issues with the initial STARS systems, FAA has developed STARS software incrementally to incorporate needed features. Now that STARS is almost fully developed, we have deployed eleven systems, including the first two key sites at Syracuse, New York and El Paso, Texas, and a fully operational system at Philadelphia. We are testing incremental software improvements and will install them on all operational systems. We will be installing the additional STARS systems with all planned features.

5.2.3.4 Surveillance Systems

Several projects are underway to replace the surveillance radars and beacon interrogators that provide position information to controllers. In the terminal area the airport surveillance radar – model 11 (ASR-11) will be replacing ASR-8 radars and earlier models. The ASR-11 provides digital information to the terminal automation systems, which is compatible with the STARS design. Older air traffic control beacon interrogators (ATCBI) are being replaced by the new ATCBI-6. The FAA replaced a portion of the ATCBI systems with a system known as mode select and the remaining older systems are now being replaced with ATCBI-6. FAA is also renovating the terminal radar system used at larger airports, which is the ASR-9, to extend its life for several more years. All these projects reduce radar outages and improve the information that controllers have on their displays, so that they can be more effective in controlling air traffic.

5.2.3.5 Weather and Radar Processor (WARP)

Accurately depicting and forecasting weather is key to increasing the efficiency of air traffic control. The WARP provides timely weather radar information to the controllers, traffic management specialists and the center weather service unit meteorologists at the en route centers. They use this information to advise pilots of the routes least affected by weather and to help air traffic flow managers decide how to apply advanced air traffic management tools. Having better information about the weather and a shared situational awareness, center air traffic controllers can improve the efficiency of traffic flows and minimize delays caused by having to avoid bad weather. We will upgrade the system to be compatible with the upgrades to weather radars operated by the National Weather Service, add software products developed by the weather research program; and modernize the WARP hardware. We have installed the equipment at all en route centers. We will add improvements in phases over the next several years.

5.2.3.6 Terminal Air Traffic Control Facilities

The towers and TRACON facilities that control traffic in the terminal area require modernization for a number of reasons. In some cases, visibility of the runways and taxiways has been restricted by new construction, and the towers need increased height to provide controllers a clear view of the airport operating area. In other cases, the facility is too small for the installation of new automation equipment. A third reason is the age and condition of the facility. FAA has more than 400 air traffic control towers, and, as towers age, they require new infrastructure or replacement. FAA replaces about 10 towers per year and will continue replacing or modernizing towers well into the future.

5.2.3.7 New York Integrated Control Center

There are several inefficiencies in current airspace configuration in the New York area. We are in the early planning stages of airspace design changes for the metropolitan area. We are studying the option of replacing the existing consolidated TRACON and the en route center with a single facility that will address capacity constraints. Problems in the area currently include:

- Airspace restrictions that limit controller flexibility due to geographic proximity of the region’s three major airports
- An airspace allocation that creates narrow one-way corridors that cannot handle increased levels of air traffic
- A route structure for arriving aircraft that cannot provide a uniform flow of traffic to airports

Consolidating the facilities and the airspace they control will allow more efficient use of the total airspace and reduce the artificial boundaries that inhibit better use of the airspace.

5.3 Sustain the Air Traffic Control System To Reduce Aviation Delays

All of the projects that improve system efficiency would be ineffective if the hardware and software that form the core of the air traffic control system became unreliable. Computers and software have a limited life. Manufacturers are constantly upgrading their hardware and normally discontinue making parts for older equipment once a new generation of equipment is in widespread use. Thus, spare parts are difficult and expensive to acquire. Also, as new software languages are developed, younger employees are not prepared to work with obsolete languages. All of these factors require existing equipment to be replaced or technically upgraded.

5.3.1 Prevent Air Traffic System Outages

Even short-duration air traffic outages can cause losses of several million dollars because of resulting delays and flight cancellations. The FAA has several projects that maintain, update and modernize both the buildings and equipment used in the NAS. We must renew both physical infrastructure, such as electrical distribution systems and heating and ventilation systems, and the hardware and software that comprise the automation systems used for air traffic control. In addition, our experience shows us that once we install new equipment the electrical grounding systems that protect these systems from lightning-strike voltage spikes and commercial power irregularities are inadequate. The solid-state devices used in modern equipment are very sensitive to voltage spikes and we must install an elaborate system of electrical grounding to protect them.

The paragraphs below discuss the most important projects for sustaining the existing system and preventing outages.

5.3.1.1 En Route Automation

The En Route Automation Modernization program has several components. At the heart of the en route air traffic control system is the host computer system (HCS). It processes and formats flight plan and aircraft position information for portrayal on the air traffic controller workstations. It also calculates the speed at which the aircraft is moving over the ground and can project the aircraft's position for a short time into the future. This is important if there is a radar outage. We expect to replace these computers by 2009.

During the 1990s, the display system replacement program replaced en route controller workstations and displays. As the displays wear out, we must refurbish and eventually replace them. Production of the original large display tubes has been discontinued, and the FAA is assessing options for replacing the controller workstations as part of the en route system modifications project.

The software used in the HCS for automation applications is written in an obsolete programming language. When the HCS is replaced in 2009, we will not be able to port this software onto the next generation of computers. Furthermore, there are few computer programmers, who are interested in working in this obsolete language. This makes it difficult to maintain the software. The FAA has begun rewriting the host computer system software in a modern language.

Another computer system called the peripheral adapter module replacement item (PAMRI) supports the HCS. The PAMRI receives data from the radars that determine aircraft position, flight plan data from computer tapes, and communications from other air traffic facilities and formats the information for use by the HCS. In 2004 the FAA will replace the PAMRI with a new system called the en route communication gateway as part of our en route modernization program. The existing PAMRI is nearly 10 years old, and we must replace it to remain compatible with HCS upgrades.

If the HCS fails, a back up system called direct access radar channel can process the radar data directly from the PAMRI to the controller displays. This system has evolved over time and has some limitations in backing up a modernized en route automation system. The FAA will replace this system when we modernize the en route system.

In addition to the computer systems and software, we need to replace several outdated host computer system peripherals. Over the next five years FAA will be replacing obsolete and worn-out storage devices, printers and other input/output devices used with the HCS. The new peripherals have more capacity and be more efficient to operate.

5.3.1.2 Voice Switch Replacements

Good communication is essential for air traffic control. Radios used by pilots and controllers to communicate have a limited range. To extend the range of those radios, remote sites are located at the approximate distance from air traffic control facilities where there would not otherwise be clear radio communications. Radio communications between pilots and flight service specialists also must be enhanced by use of remote radio sites. The radio communications from these remote sites are usually carried on telephone lines to the air traffic control facility.

Controllers must also communicate with other air traffic control facilities either by voice or through system-generated messages. A communications switch that serves the entire facility transfers these messages from the telephone lines to the controllers. We must modernize these switches to take advantage of improvements in technology and to provide more efficient service. We are replacing 10-20 voice switches annually at towers, TRACON facilities, and flight service stations and will continue to do so over the next five years. In addition, we are examining strategies to modernize the large voice switches at the en route centers and will either modernize or replace the large switches installed under the voice switching and control system (VSCS) program. In the near term, the FAA is replacing the VSCS training and backup system at all the en route facilities.

5.3.1.3 Electrical Power Systems

Many FAA facilities have electrical generators and large battery banks that ensure continuity of electrical power during commercial power outages. The air traffic control system requires these back-up systems to maintain reliability and to avoid outages. Outages may require us to separate aircraft manually, which is very inefficient and severely restricts capacity. The existing emergency generators are very old, and, in many cases, the manufacturers have gone out of business. We must replace these systems to preserve reliability of the air traffic control facilities.

5.3.1.4 En Route Centers and Unmanned Facilities

The air route traffic control centers house the en route centers, and modernization is ongoing to keep these facilities in good operating condition and to accommodate the installation of new equipment. Roofs must be maintained, electrical wiring must be updated as new equipment is installed, and the heating and ventilating systems must be upgraded to protect the sensitive electronic equipment housed in the centers. This program is essential for NAS modernization and must be sustained well into the future.

The thousands of remote radios, navigation aids, and radars used for air traffic control are housed in permanent buildings that must be maintained to prevent damage to the electronic equipment. Outages of the equipment housed in these facilities can cause air traffic delays. The FAA must maintain and modernize these buildings to ensure continued and reliable operation of the equipment inside.

5.3.2 Improve Management Tools To Accommodate Expansion

Several projects in the CIP are designed to help FAA manage capital investment more efficiently. Any large organization can benefit from automated management tools and access to specialized technical information to deal with rapid change in business practices and technology. The FAA has contracted for information technology systems that automate cost and schedule estimates. As with private industry, we have benefited from using computer-aided design tools. Contractors also provide expertise in developing specifications and documentation of building and equipment configurations. This has helped us manage the large base of high technology equipment that comprises the air traffic control system. Other examples of improved management tools are:

5.3.2.1 NAS Infrastructure Management System (NIMS)

NIMS centralizes managing FAA maintenance functions. Growth in the number of FAA facilities has made this necessary. We have had to find more efficient ways to maintain all our new equipment. We manage our maintenance from a national operations control center and three regional operational control centers. All new FAA equipment has remote maintenance monitoring, and managers can detect problems from these central facilities. The regional maintenance centers can then send field technicians to prevent or repair outages. This reduces the number of technicians needed at remote locations and allows us to use them more efficiently. NIMS will reduce the number and length of unscheduled outages by managing the workforce and providing outage information and real-time status needed by the workforce.

5.3.2.2 FAA Telecommunications Infrastructure

The FAA controls air traffic over the entire United States and over international oceanic areas. The FAA needs an efficient and modern telecommunications system to perform its air traffic functions and mange our many dispersed facilities. We have contracted with a major telecommunications provider for support of communications among our facilities. This new approach will be more efficient than the existing system and provide us with more software tools to measure communications use and allocate the costs to organizations more accurately.

5.4 Protect FAA's Critical Infrastructure

Since September 11, 2001, there has been a heightened awareness of the need to protect the critical infrastructure of the United States. The air traffic control system is part of that critical infrastructure. There are many aspects to protecting critical infrastructure, and FAA has two specific programs to protect it. One is protecting facilities and employees, and the other is protecting information technology systems.

5.4.1 Facility Security Risk Management

The first step in facility security risk management is to assess FAA's facilities to determine their vulnerabilities and compliance with Department of Justice security standards. We certify buildings in compliance and bring buildings needing additional security measures into compliance. We have developed a prioritized listing of our staffed facilities to identify modifications, procedures, and measures to enhance the security and safety of FAA personnel and facilities. Security systems include surveillance systems, intrusion detection systems, and access control systems.

5.4.2 Information Security

In the past, many air traffic control automation systems were closed systems with proprietary software. These systems were very resistant to unauthorized entry. As FAA has modernized its automation systems, more commercial software has been incorporated which creates a new vulnerability. We are assessing the vulnerabilities of all our critical systems and determining what protections we must add to prevent unauthorized access and disruption of the air traffic control system. We must also incorporate an intrusion detection system so we are aware of any efforts, successful or not, to gain access to our information technology systems. Improving information security will be a growing expense for many years into the future.

6 Appendices to the Capital Investment Plan

The CIP contains four appendices as shown below:

Appendix A
- Lists CIP projects
- Describes how projects relate to performance goals

Appendix B
- Lists CIP projects with over $5 million in expenditures
- FY 2002 Program Accomplishments
- FY 2003 Output Goals
- FY 2004 Output Goals
- Key Events FY 2005-2008

Appendix C
- Provides estimated expenditures 2004–2008 by Budget Line Item

Appendix D
- Lists of Acronyms and Abbreviations

7 Conclusion

There are several important reasons for preparing the 5-year Capital Investment Plan (CIP). In addition to the legislative mandate to prepare the CIP, the FAA must look to the future to ensure that we are addressing capacity and reliability issues. If we do not plan for the system of the future, it will not be able to accommodate predicted travel demand, and NAS performance will deteriorate. The high standards of performance for FAA equipment and automation systems require lengthy testing and implementation schedules. We must plan now for modernization to keep pace with an industry that is technically sophisticated and demanding better services.

The CIP provides full visibility into the scope and planned schedule for capital expenditures. This information allows an informed dialogue on the pace and content of our modernization efforts. The FAA is facing many challenges in modernizing the NAS. Because the air traffic control system is complex and the rate of technology change is rapid, we must decide on the level of technology we want to incorporate in our systems now. Our partners in the aviation world are also pushing technology change and we must be attuned to the changes proposed by industry. These changes require resources, and we must articulate the need for these planned changes in a long-term plan—the CIP.